EXPERIENCES BUILDING A EUROPEAN STYLE HOT WATER CAMPUS DISTRICT ENERGY SYSTEM IN NORTH AMERICA

RAMBOLL

Sheridan | Get Creative

AGENDA

1. **Energy Planning –** Achieving stakeholder buy
2. **European Design –** Advantages & highlights
3. **Procurement –** Right sourcing
4. **Construction –** Lessons learned
5. **Next steps –** Connecting buildings
6. **Questions?**

RAMBØLL

Sheridan | Get Creative

AGENDA

1. **Energy Planning –** Achieving stakeholder buy
2. **European Design –** Advantages & highlights
3. **Procurement –** Right sourcing
4. **Construction –** Lessons learned
5. **Next steps –** Connecting buildings
6. **Questions?**

RAMBØLL

Sheridan Get Creative

ABOUT SHERIDAN

RAMBOLL

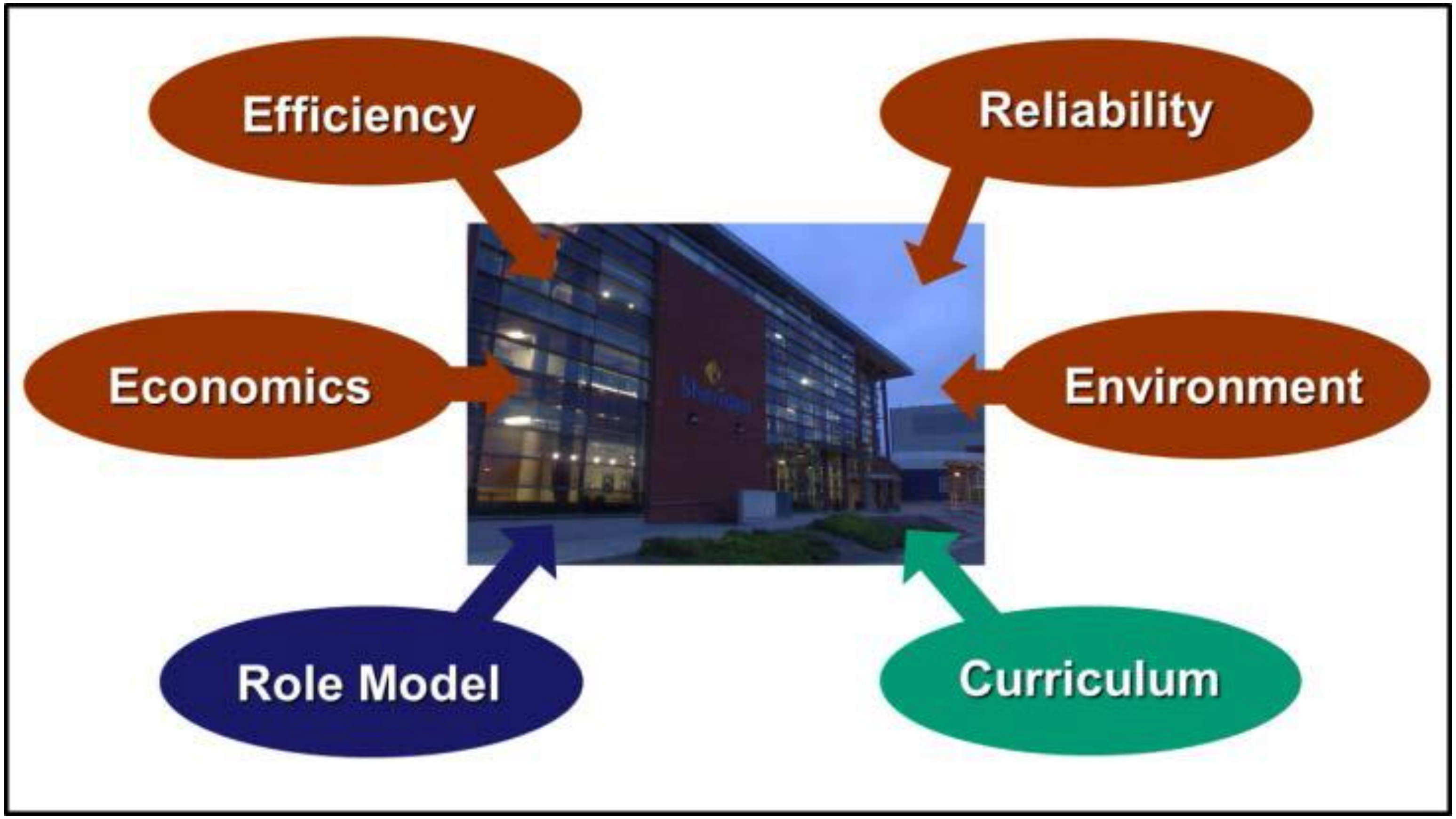
Sheridan | Get Creative

INSTITUTIONAL PAIN POINTS

RAMBOLL

Sheridan | Get Creative

BROADER GOALS



SETTING GOALS

Standard Energy Plan	Breakthrough Energy Plan
Built on Expected Performance	Drives Exceptional Performance
Uses a Forecasting Approach	Uses a Backcasting Approach
Builds Technical Case, Then Financial	Builds Both Cases Simultaneously
Predetermines an Approach	Suggests Approaches, Then Tests
Uses Simple Financial Models	Uses Integrated Financial Models
Energy Savings < 20%	Energy Savings > 50%
	Inspires Organization
	Establishes Leadership Position

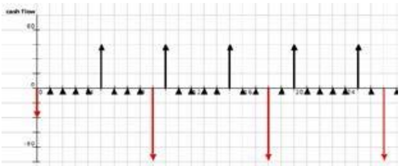
RAMBØLL

Sheridan | Get Creative

MAINTAIN PLANNING OWNERSHIP

- Supports Organizational Learning and Growth
- Leverages Competencies Within Organization
- Leverages Competencies Around Organization
- Aligns Team Around Implementation

SET FRAMING GOALS



7% Internal Rate of Return

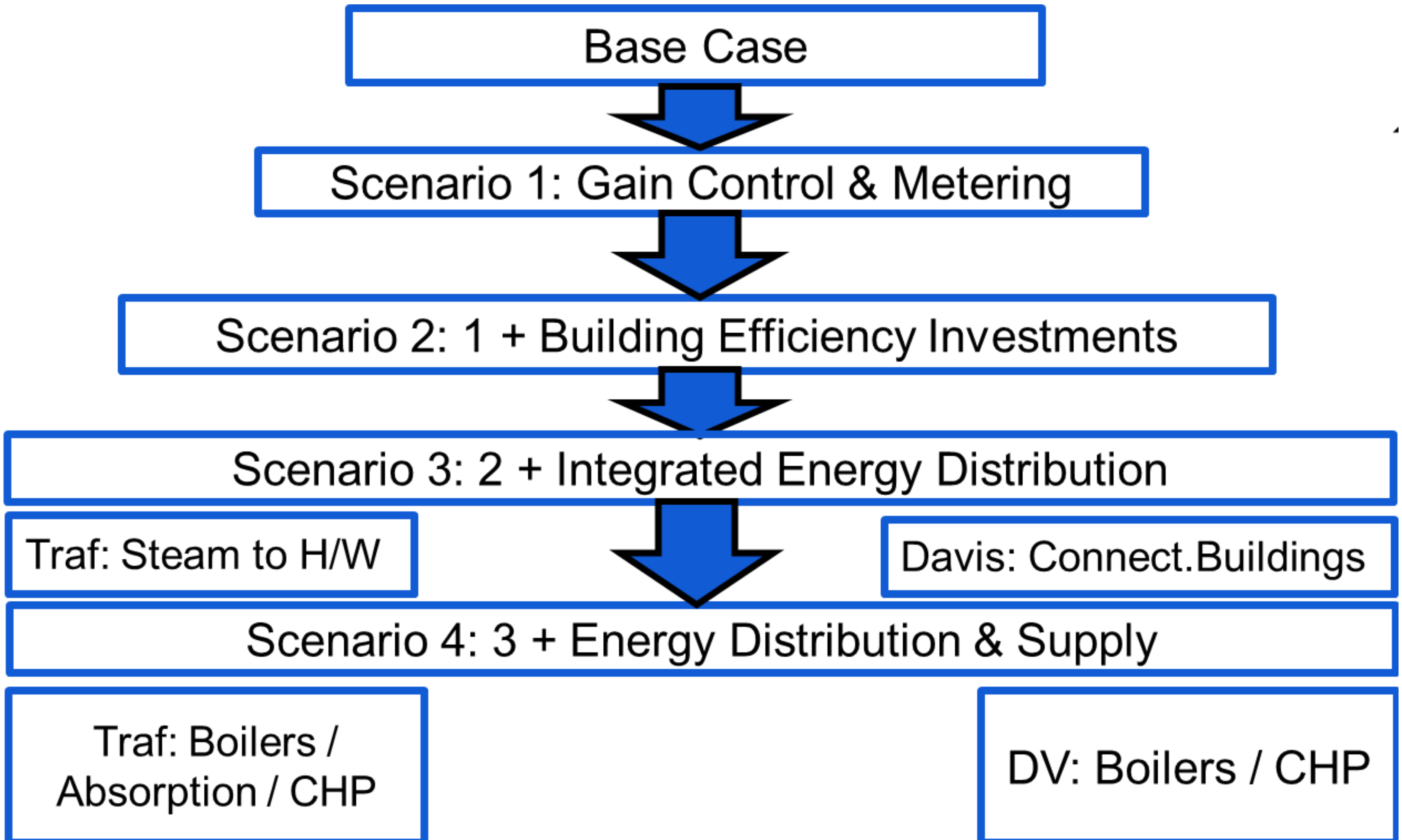
40% Reduction in Carbon Emissions

50% Reduction in Source Energy Consumption

RAMBØLL

Sheridan | Get Creative

CONSTRUCT SCENARIOS



SHERIDAN'S RESULTS

Condition		Energy (MWh/year)					Emissions	Savings (%)		
#	Scenario	Gas	Electricity Purchase	Electricity conversion	Total on site	Total Source *)	CO_2 (mt)	Energy on site	Energy Source	CO_2
	Including PV Constant CO2-Index Electricity									
	Baseline 2010	19,900	28,300	57,500	48,200	105,700	9,660	0%	0%	0%
2035 Results										
0	Scenario 0: Base Case	23,300	31,100	63,100	54,400	117,500	10,900	-	-	-
1	Scenario 1: Gain Control	16,100	19,200	39,000	35,300	74,300	7,080	35%	37%	35%
2	Scenario 2: Gain Control and Building Efficiency	12,100	13,000	26,400	25,100	51,500	5,030	54%	56%	54%
3	Scenario 3: Integrated Energy Distribution	12,100	13,000	26,400	25,100	51,500	5,030	54%	56%	54%
4	Scenario 4: Integrated Energy Supply	24,400	4,600	9,300	29,000	38,300	5,820	47%	67%	47%

*) Source energy: Energy used on site plus energy losses in electricity generation and distribution

RAMBOLL

Sheridan | Get Creative

Building Automation Operator Display

RAMBØLL

Sheridan | Get Creative

Hundreds of Pounds of Copper Cabling Removed

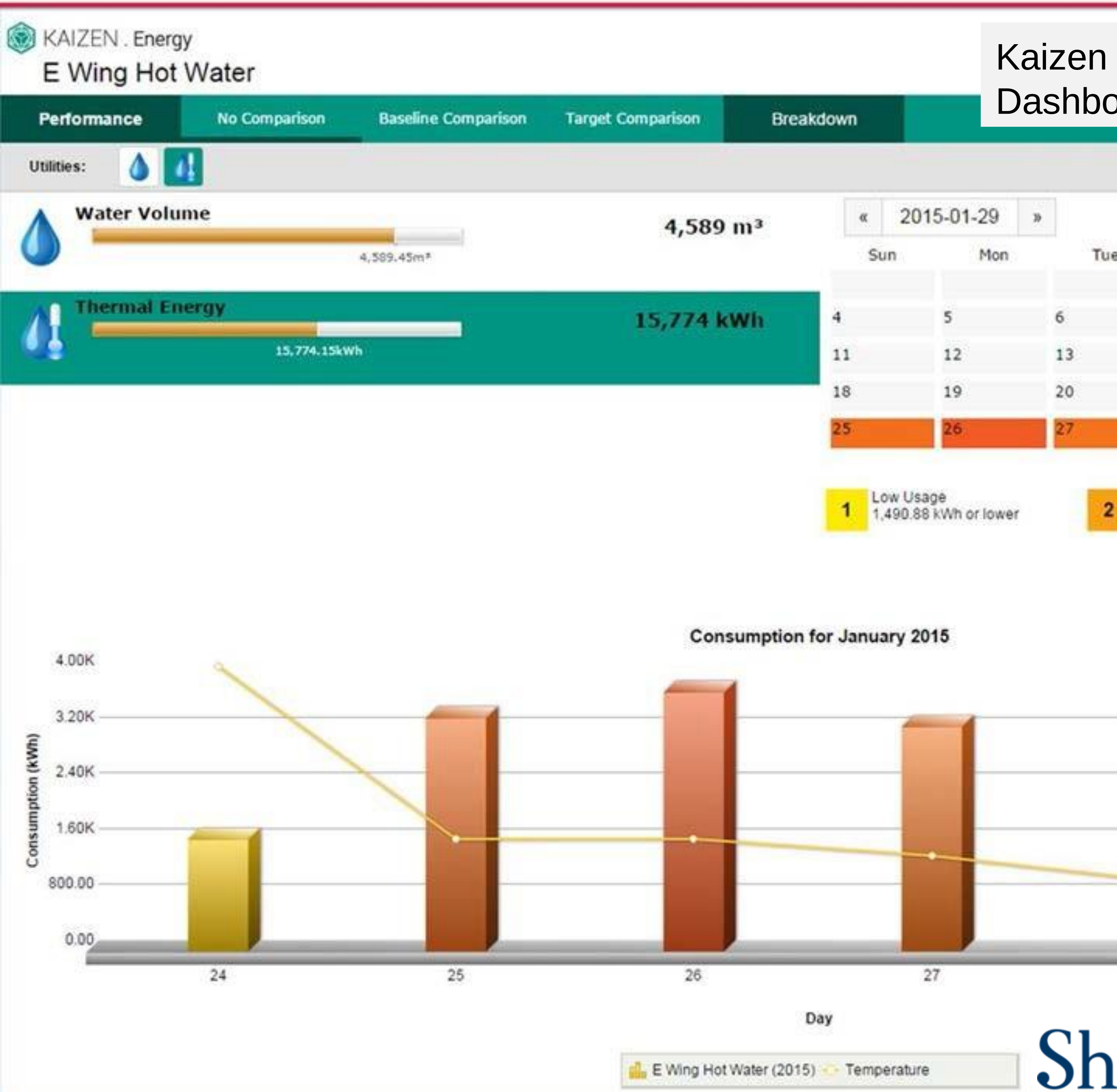
RAMBOLL

Sheridan | Get Creative

G Wing: Thermal and Flow Meters Interfaced to BAS

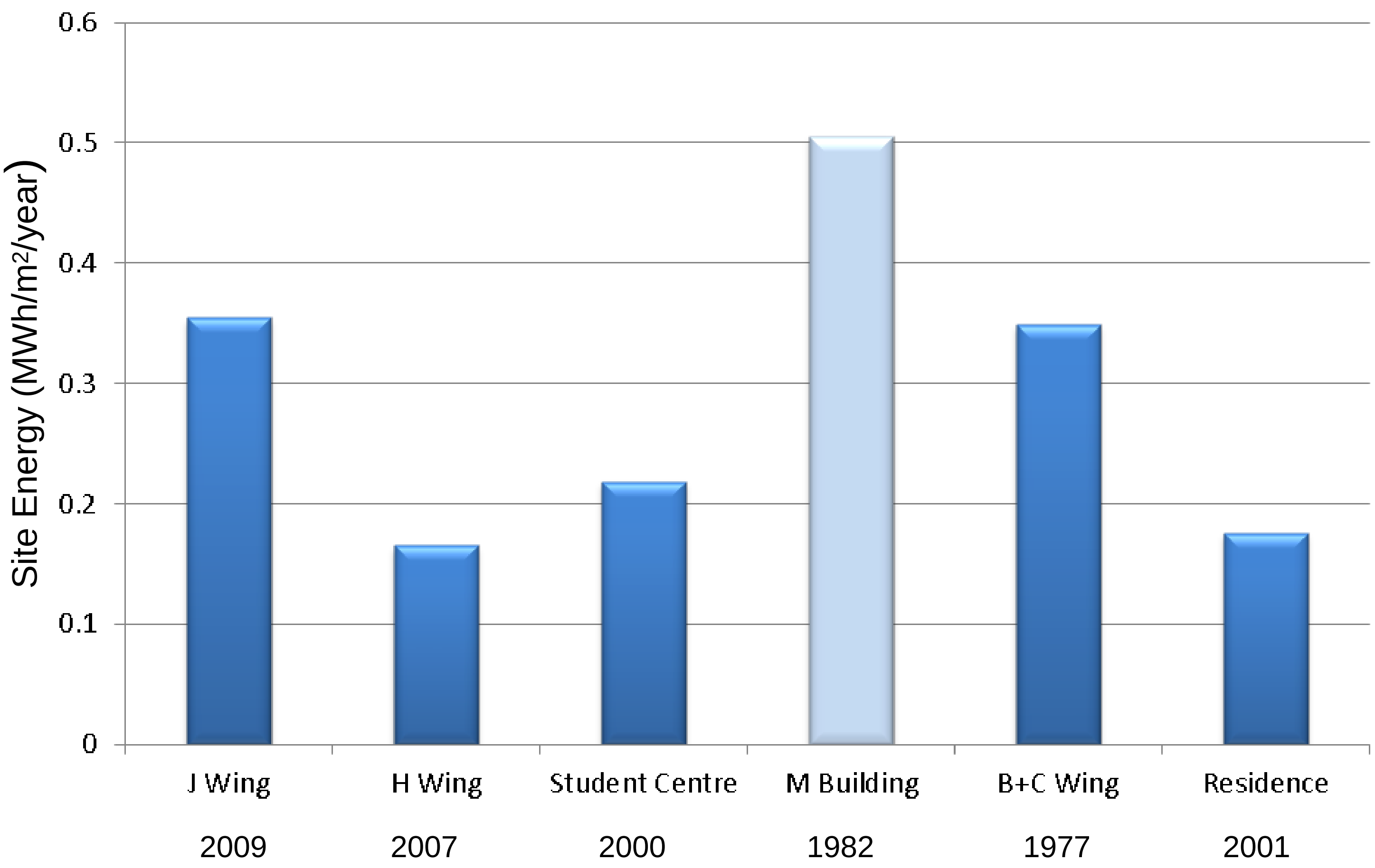
Sheridan | Get Creative

Kaizen Metering Dashboard



Sheridan | Get Creative

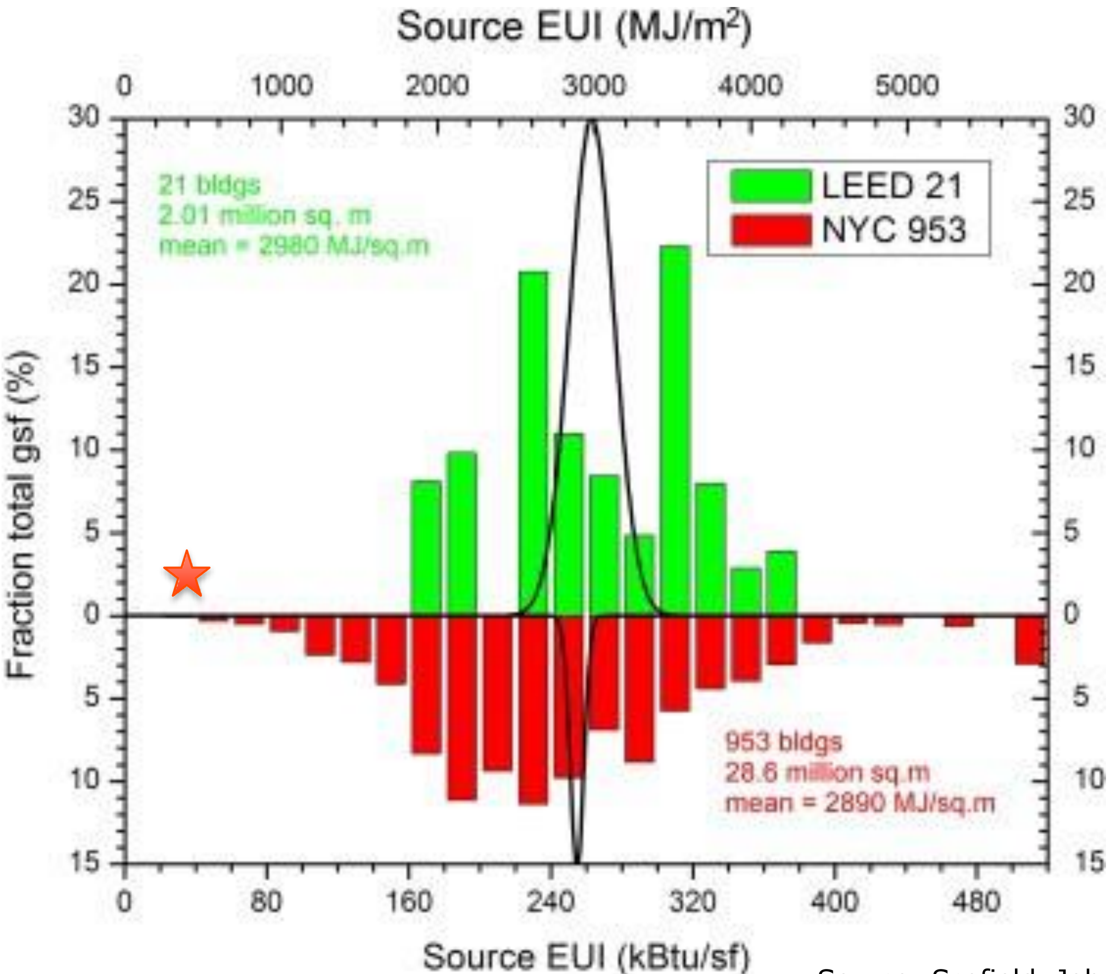
BUILDINGS – DAVIS CAMPUS



RAMBØLL

Sheridan | Get Creative

LEED BUILDING STUDY - 2013



Source: Scofield, John H. Efficacy of LEED-certification in reducing energy consumption and greenhouse gas emission for large New York City office buildings. *Energy and Buildings* (December 2013). Elsevier.

RESULTS – NEW BUILDINGS

RAMBØLL

Sheridan | Get Creative

AGENDA

1. **Energy Planning –** Achieving stakeholder buy
2. **European Design –** Advantages & highlights
3. **Procurement –** Right sourcing
4. **Construction –** Lessons learned
5. **Next steps –** Connecting buildings
6. **Questions?**

RAMBOLL

Sheridan | Get Creative

REGULATIONS AND STANDARDS *IMPACT QUALITY*

ASME B36.10	Welded and Seamless Wrought Pipe	EN 10216	Seamless Steel Pipe
		EN 10217	Welded Steel Pipe
ASTEM A53	Steel Pipe		
ASTEM A106	Seamless Steel Pipe		
		EN 253	District Heating Pipes
ASTM F2165	Pre-Insulated Bonded Piping	EN 448	District Heating Fittings
		EN 488	District Heating Valves
		EN 489	District Heating Joints
ASME B31.1	Power Piping	EN 13941	Design and Installation of District Heating Pipes
		EN 14419	Surveillance Systems

Piping Installation
Best of Both Continents
ASME vs. EN Standards

Temp = < 100°C (212°F)

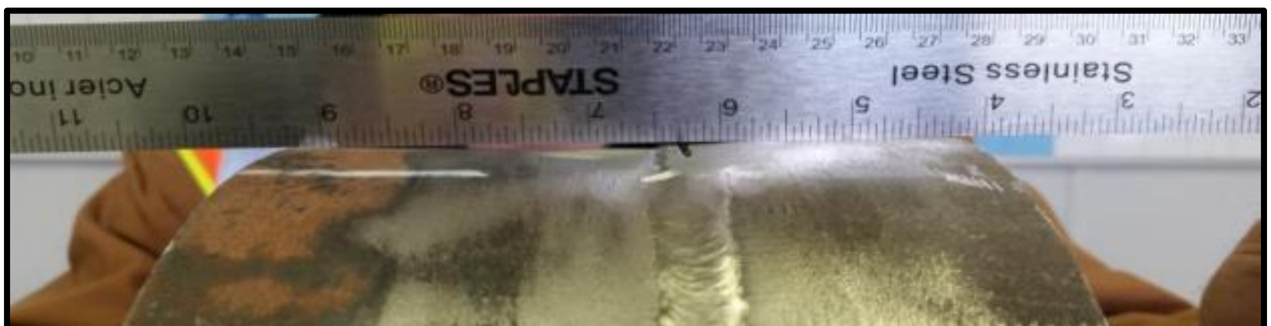
Pres. = < 10 bar (145 PSI)

<u>Regulation</u>: ASME B31.1 – Power Piping

- X-Ray not required
- Alignment to be within 2mm
- Hydrostatic pressure test to be 1.5 times the design pressure, held for 10 minutes, then reduced to design for leak test

<u>Standard</u>: EN 13941 – Design and installation of preinsulated bonded pipe systems for district heating

- X-Ray required on 10% of welds
- Alignment to be within 1mm
- Pressure test is not required, but weld leak tightness test of all welds is



RAMBOLL

Sheridan | Get Creative

Davis Campus District Energy Infrastructure

RAMBOLL

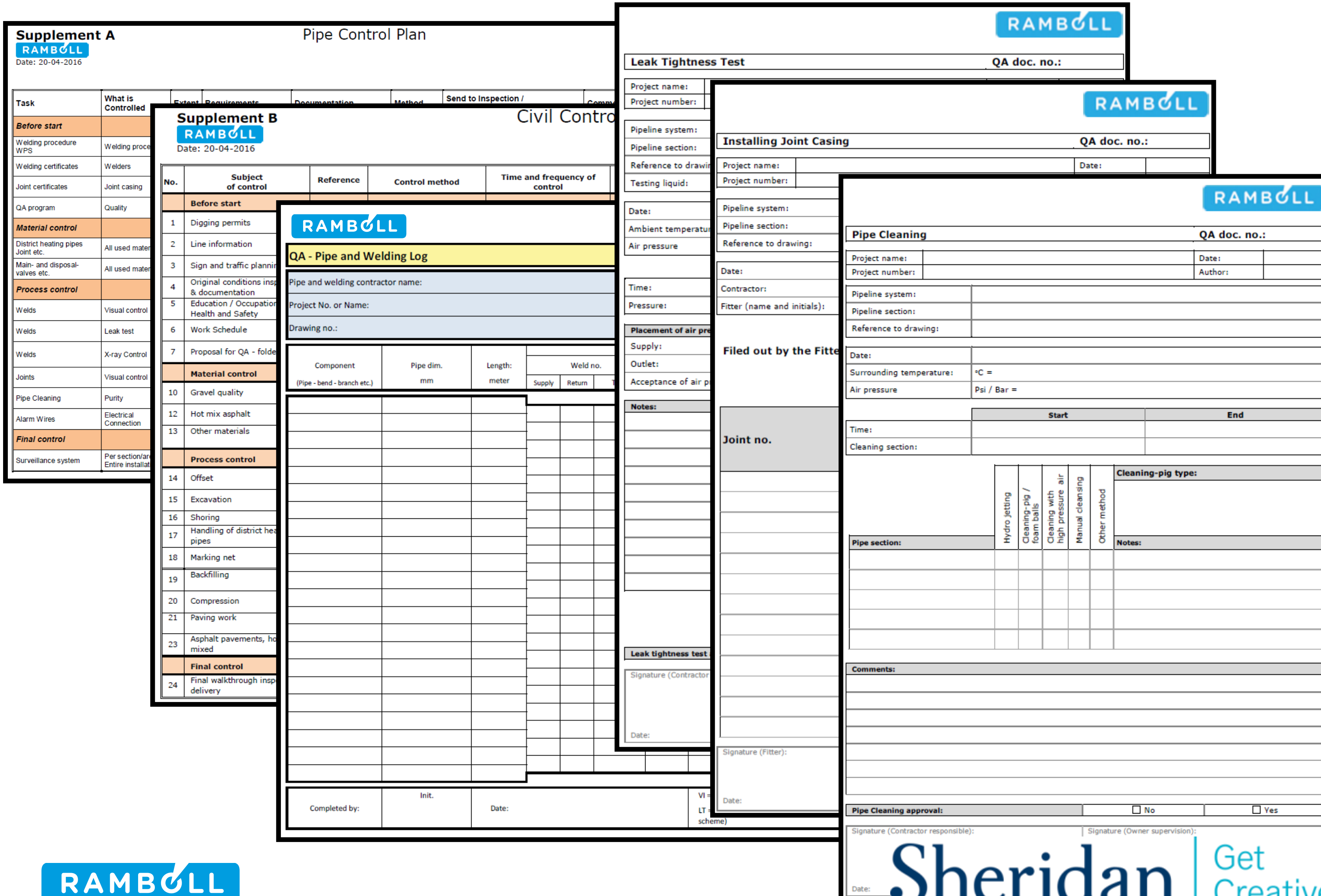
Sheridan | Get Creative

Trafalgar Campus District Energy Infrastructure

RAMBOLL

Sheridan | Get Creative

Quality Control



RAMBØLL

Sheridan | Get Creative

AGENDA

1. **Energy Planning –** Achieving stakeholder buy
2. **European Design –** Advantages & highlights
3. **Procurement –** Right sourcing
4. **Construction –** Lessons learned
5. **Next steps –** Connecting buildings
6. **Questions?**

SUPPLIERS


Canada
110221090114


Sheridan
Shipping & Receiving
Student Centre
Rec Room
25
km/h

CONTRACTORS

RAMBOLL

Sheridan | Get Creative

AGENDA

1. **Energy Planning –** Achieving stakeholder buy
2. **European Design –** Advantages & highlights
3. **Procurement –** Right sourcing
4. **Construction –** Lessons learned
5. **Next steps –** Connecting buildings
6. **Questions?**

RAMBOLL

Sheridan | Get Creative

OWNER – LESSONS LEARNED

- Certified welding procedures as part of tender requirements
- Thoroughly investigate existing site conditions
- Single-person responsibility for material
  - Confirm proper use
  - Carefully track stock
- Know your contract rights, and theirs
- Site coordination is important

CONSULTANT – SITE INSPECTION

RAMBOLL

Sheridan | Get Creative

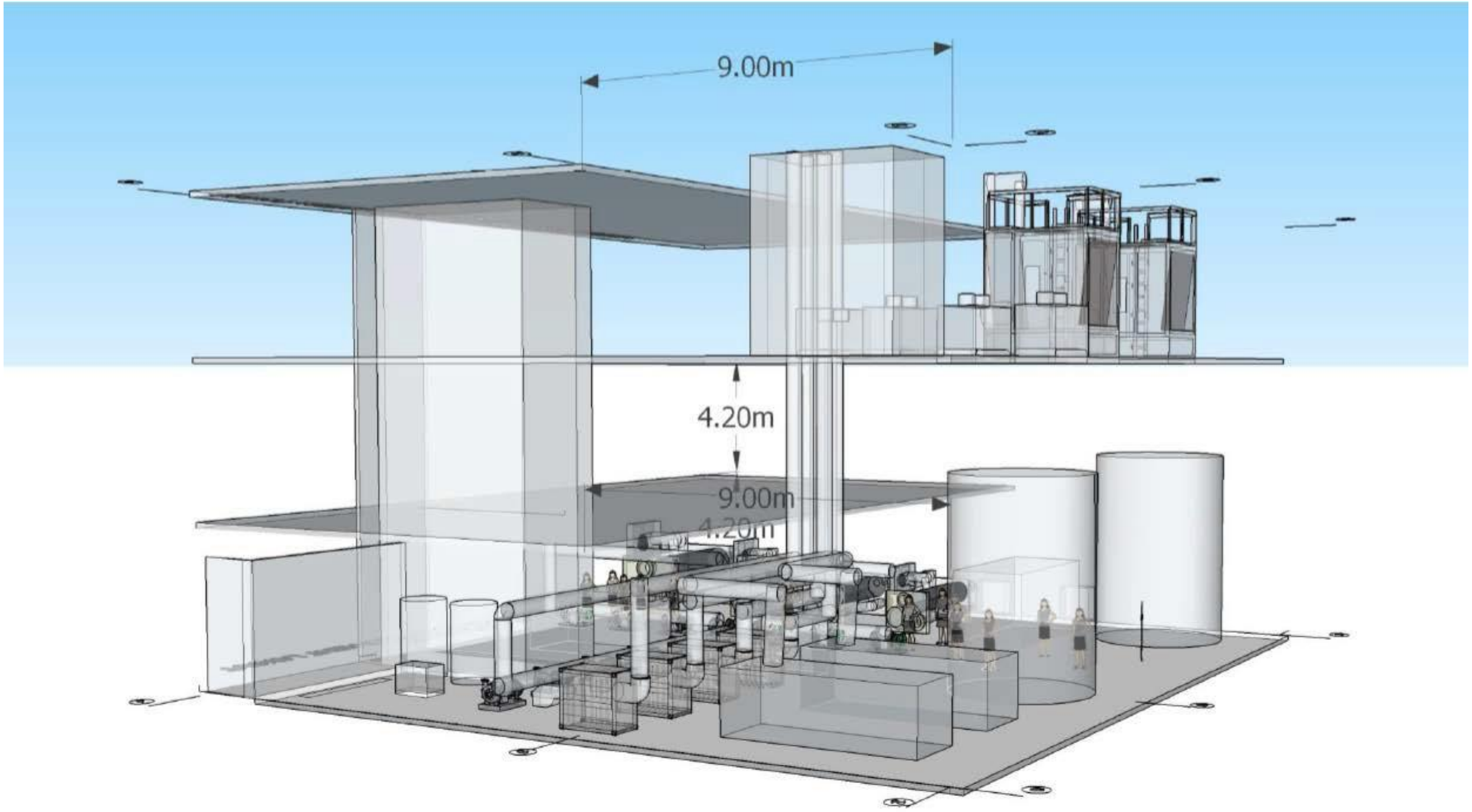
AGENDA

1. **Energy Planning –** Achieving stakeholder buy
2. **European Design –** Advantages & highlights
3. **Procurement –** Right sourcing
4. **Construction –** Lessons learned
5. **Next steps –** Connecting buildings
6. **Questions?**

RAMBOLL

Sheridan Get Creative

ENERGY CENTRES & CONNECTIONS



RAMBØLL

Sheridan | Get Creative

SOLAR PHOTOVOLTAIC

Option: Solar PV

RAMBØLL

Sheridan | Get Creative

THANK YOU

QUESTIONS?

JOHRA@ramboll.com
Herbert.sinnock@sheridancollege.ca
Katherine.rinas@sheridancollege.ca

READ MORE ON OUR WEBSITE:
WWW.RAMBOLL.COM/ENERGY